June 3, 1930. J. D. REDMOND 1,761,311

LOWERING MECHANISM APPLICABLE FOR USE IN PORTABLE LIFE SAVING APPARATUS

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Fig. 1.

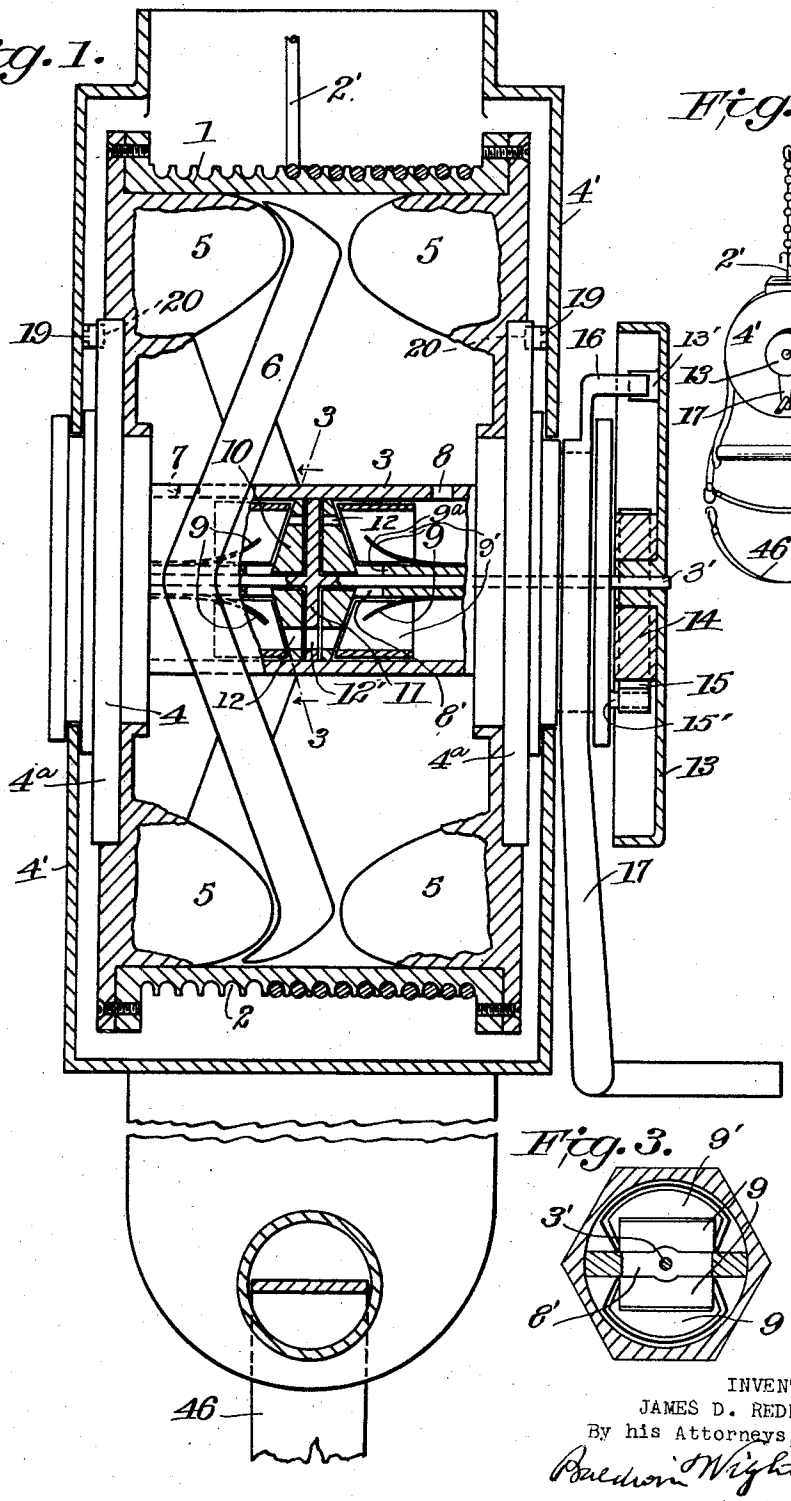


Fig. 6.

Fig. 3.

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Fig. 3a

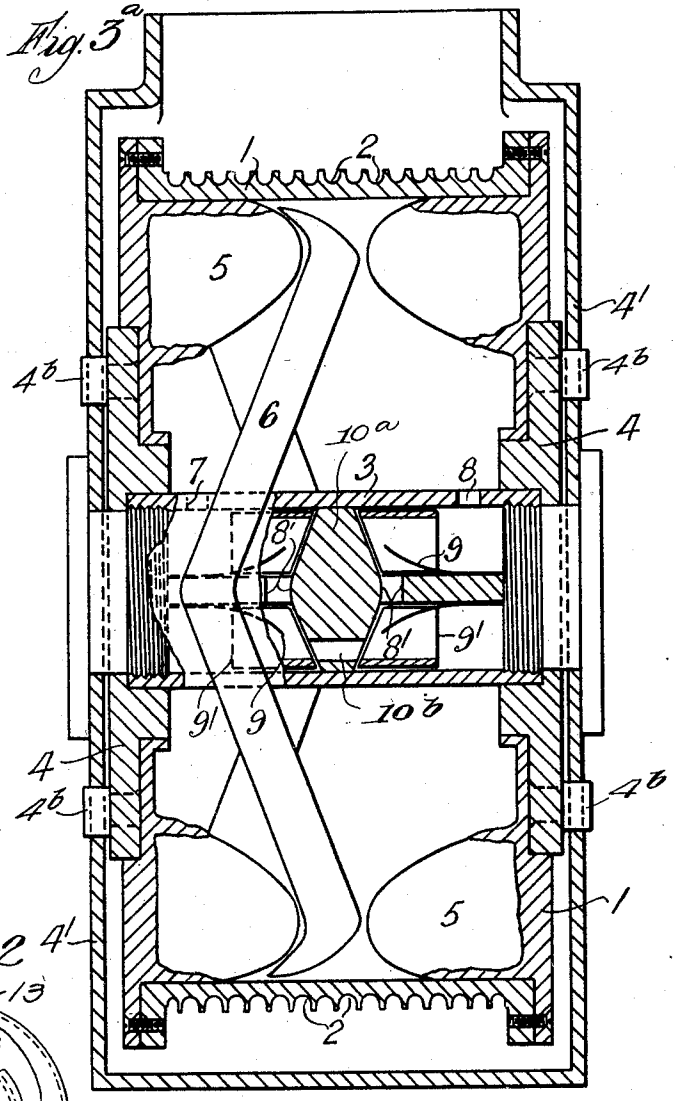


Fig. 2

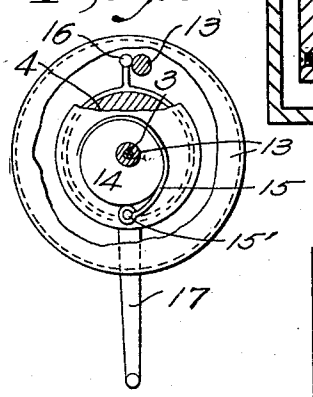
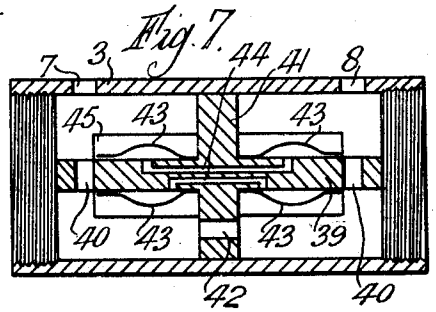


Fig. 7



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Fig. 4.

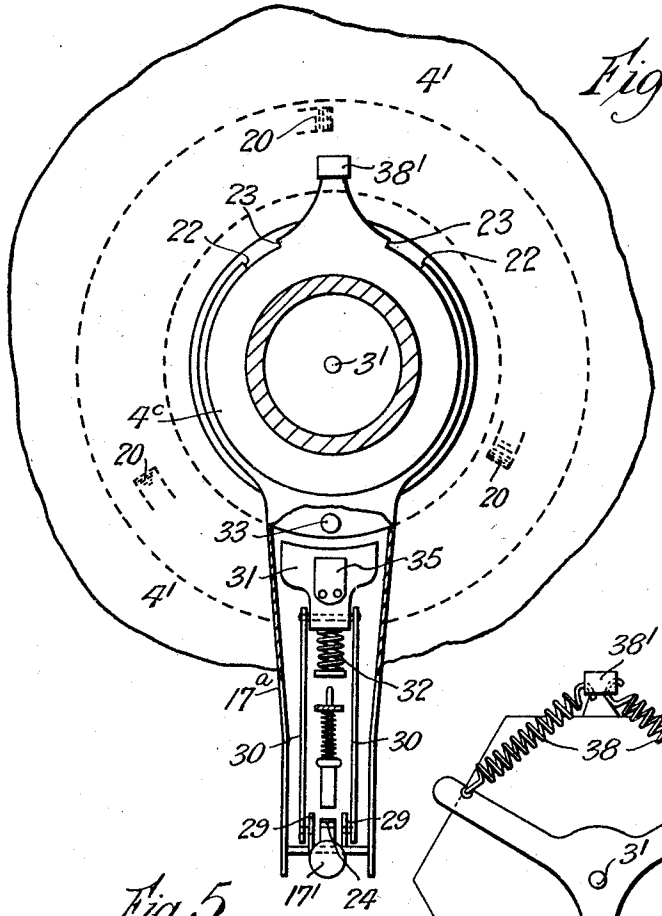


Fig. 5.

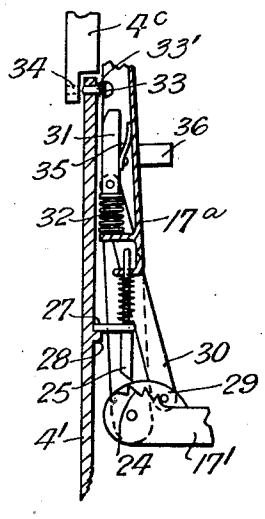
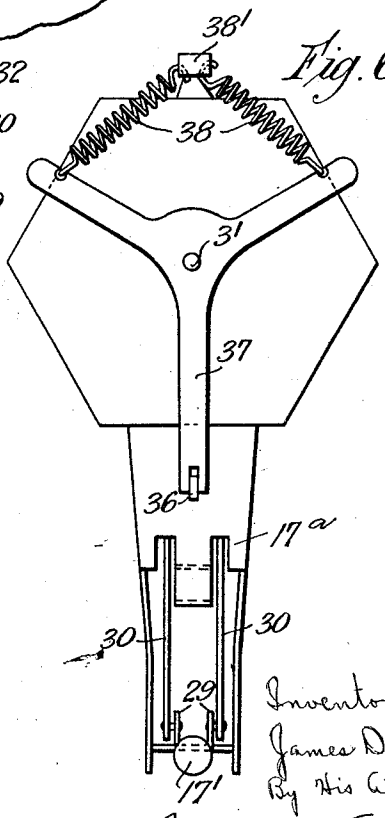


Fig. 6.



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Patented June 3, 1930 1,761,311

UNITED STATES PATENT OFFICE

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LOWERING MECHANISM APPLICABLE FOR USE IN PORTABLE LIFE-SAVING APPARATUS

Application filed March 10, 1927, Serial No. 174,223, and in Great Britain March 16, 1926.

This invention relates to improvements in apparatus which is applicable to lowering in general, and is particularly suitable for use in life saving apparatus.

One object of the present invention is to provide a portable fire escape in which means are provided whereby the operator during his descent from a building can control the speed at which he is lowered.

In one form of construction a portable fire escape comprises a frame in which is rotatably mounted a drum adapted to receive a cable. The drum forms a liquid container and means are provided in the drum whereby the liquid is caused to flow backwards and forwards from one part of the container to another when the drum is rotated. Means are provided whereby the frame is attached to the operator. There is also provided means operable by the operator during his descent for controlling the rate of flow of the liquid in the container. Means are preferably provided for governing the rate of retardation of the flow of the liquid and means may be provided for rotating the drum in order to rewind any cable which has been paid out from the drum.

The invention is illustrated in the accompanying drawings, in which Figure 1 is a vertical section through one form of the apparatus; Figure 2 is a fragmentary elevation of the control or operating parts of said form; Figure 3 is a detail sectional view taken on the line 3—3 of Figure 1; Figure 3ª is a view similar to Figure 1 taken through a modified form; Figure 4 is a side elevation of a modified form of control handle; Figures 5 and 6 are detail views of the handle, Figure 7 is an alternative form of spindle and Figure 8 a diagrammatic view of the complete apparatus.

In the construction shown in Figures 1 to 3, a drum 1, conveniently provided with a helical groove 2 to receive a cable 2′, is rotatably mounted upon disks 4ª of a bearing 4 which is fast with a casing or frame 4′ and carries a central tube or hollow shaft 3 forming a valve chamber.

The sides of the drum 1 are provided with interior cam projections 5, which engage a diaphragm 6 slidably but non-rotatably mounted on the central tube 3 and cause the said diaphragm to reciprocate when the drum is rotated.

In this construction the drum itself constitutes the liquid container. The tube 3 is provided with ports 7, 8, through which the liquid is forced by the movement of said diaphragm 6 from one side to the other of the container. Means for automatically governing or retarding the flow of the liquid are located inside the tube, and comprise one or more springs 9 located over passages 8′ of a diametric partition 9ª in tube 3, so arranged that on increase of speed of rotation of the drum, and consequent increase in the rate of flow of the liquid, at least one of said springs is moved by the pressure of the liquid partially to close one of the passages 8′, thereby checking the flow of the liquid and consequently preventing the speed of rotation of the drum from unduly increasing.

The casing 4′ is provided with a strap 46 shown in Figures 1 and 8.

The cable may be attached to a suitable piece of furniture and the person to be lowered fastens the body strap 46 in position about his body and lowers himself from the building. On rotation of the drum, due to the weight of the body being lowered, the diaphragm 6 moves axially backwards and forwards along the tube 3, owing to the cam projections 5 on the inner face of the drum, the liquid in the container being thereby forced to flow alternately through the ports 7 and 8 in the tube 3 and through passages 8′. Preferably the liquid employed is an oil having a high degree of viscosity.

On increase of speed of rotation of the drum, and consequent increase in the rate of flow of liquid, the pressure of liquid in the tube acts on one or more of the springs 9 and bends same toward the coacting passages 8′ thus partially closing the latter passages 8′ for the liquid hence regulating the flow of the liquid. Adjacent the springs 9 are arranged shields 9′ which direct the liquid on to the springs 9.

The normal rate of flow of the liquid and consequently the speed of rotation of the

drum 1 is governed by means of a diaphragm 10 fast on the tube 3, and a plate 11 fast on a spindle 3′ which is journaled in the bearing 4 for limited rotation independently of and relatively to tube 3. The diaphragm and plate are provided with one or more ports 12 and 12′, respectively, which can be moved more or less into and out of registration with one another through rotation of the spindle 3′.

Fastened on the spindle 3′ is a manually operable disk 13 having an eccentric 14 which is partly embraced by an arcuate spring 15, one end of which is secured to a pin 15′ fast in the bearing 4, the spring tending always to return the disk to its normal position as in Figure 2. The disk is provided with an abutment 13′ which engages in the normal position, a stop 16 on an actuating lever or handle 17 fast on the bearing 4. The openings of the ports 12 can be varied by rotating the disk 13 and thus the rate of flow of the liquid is controlled.

The bearing 4 is not fast with the casing or frame 4′, but is normally connected thereto by conventional pawls 19 on the frame 4′. Said pawls engage ratchet depressions or teeth 20 on the drum bearing disks 4ª. When the cable is running out, the drum rotates freely on its bearings, but on rewinding, the initial movement of the handle 17 through engagement of lugs 16 and 13′, slightly rotates disk 13 to the extent permitted by cam 14 and spring 15, thus moving port 12′ out of registery with the ports 12 which partly or completely closes the latter ports. Further movement of the handle 17 rotates the bearing 4 and diaphragm 6 and since the area of the ports 12 is small, the drive is transmitted through the liquid to the drum, the pawls 19 riding over the ratchet depressions 20.

In operation, when cable 2′ is fastened to furniture or the like, and strap 46 is secured to the body, the apparatus is used to control the descent of the person, the tube 3, bearing 4 and handle 17 fast therewith are held from rotation by the engagement of pawls 19 with the ratchet depressions 20, the drum 1 rotating on the bearing disks 4ª. If the person desires to vary his rate of descent, he manually rotates the disk 13 in a clockwise direction and hence the spindle 3′ and disk 11 is rotated with respect to the bearing 4. Immediately upon release of the disk 13, it is urged back to its normal position where lug 13′ and lug 16 engage, by the action of the spring 15. During rewinding, the lug 13′ is maintained in engagement with the lug 16 by the spring 15 and eccentric 14, and due to this engagement, the disk 11 is rotated at the same speed as the disk 10, and thus the same normal relative position is maintained between the disks 10 and 11.

Referring to the modified form of Figure 3ª, most of the parts are similar to those previously described and in such instances, bear the same reference characters. The bearing 4, however, is rigidly fixed at 4ᵇ to the casing 4′. A diaphragm 10ª is fixed in tube 3 and has a passage 10ᵇ therethrough so that the liquid may travel through ports 8, 8′, 10ᵇ and 7 and vice versa, under control of spring valves 9. This form of the invention omits the descent-regulating control consisting of valve plate 11 and associated parts of the preceding form.

In the modified form of control handle shown in Figures 4, 5 and 6, the operating handle or lever 17ª primarily supplants handle 17 and disk 13 of Figures 1 to 3 and is loosely mounted on the drum bearing 4ᵇ equivalent to that at 4 in the preceding figures, and is provided with shoulders 22 which are adapted to engage shoulders 23 on the drum bearing. A handle 17′ pivotally mounted on the lever is provided with ratchet teeth 24 which engage a spring operated pawl 25 carried by the lever. On the pawl 25 is a projection 27 which may be engaged by a cam surface 28 on the frame 4′, the cam being so arranged as to withdraw the pawl from the ratchet only when the lever is in a central vertical position, in which position the ports 12 and 12′ are in their normal setting, that is, in full registry. In said normal setting the ports are so designed that a person of normal weight will be lowered at a safe rate.

The handle is provided with two projections 29, to which are pivoted links 30, to which latter is pivoted a finger 31 pressed into operation by a spring 32, which is compressed when the handle is turned down. The finger 31 when the handle 17′ is in its raised (i. e. inoperative) position contacts with a pin 33 in the frame 4′ and pushes it (against the action of a spring 33′) into engagement with a hole 34 in the drum bearing. Bearing against the finger 31 is a spring 35 which normally tends to press the finger into engagement with the pin 33, but allows the handle to be returned to its inoperative position, even when the pin 33 is not in engagement with the hole 34.

Fast on the lever 17ª is a projection 36, engaging with one arm 37 of a three-armed spider, which is fast on the spindle 3′. Attached to the remaining arms of the spider are two springs 38, fastened at their other ends to a boss 38′ on the bearing 4ᵉ, and which normally tend to maintain the ports 12 and 12′ at their normal setting or in full registry.

In operation, the ports are normally controlled by moving the lever 17ª to the extent controlled by the shoulders 22, 23. When it is desired to rewind the drum, the lever 17ª is first moved to the position in which the ports are closed. Movement of the handle 17′, which is permitted by the pawl 25 running over the ratchet teeth 24, automati-

cally allows the withdrawal of the pin 33 by means of the links 30, thus allowing the bearing 4e to rotate relatively to the frame 4'.

Referring now to Figure 7, the tube 3 is divided into two portions by a partition 39, provided with ports 40. A second partition 41 is provided at right angles to the first having a port 42. Carried by the partition 39 are springs 43 which are acted upon by the pressure of the liquid and are flattened out so as partially to overlap the ports 40. In the partition 39 are two by-passes 44, by means of which a liquid cushion effect is imparted to the springs. Shields 45 are also provided, as in the construction shown in Figures 1 to 3.

What I claim is:—

1. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein to contain a liquid and adapted to receive a cable, means whereby the liquid in the drum is caused to flow backwards and forwards from one part of the drum to another when the drum is rotated, means for attaching the frame to the operator and means operable by the operator during his descent for controlling the rate of flow of said liquid.

2. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein adapted to contain a liquid and to receive a cable, said drum having a passage adapted to allow liquid to flow from one part of the drum to another, means whereby the liquid in the drum is caused to flow backwards and forwards from one part of the drum to another, through said passage when the drum is rotated, means for attaching the frame to the body of a user, and means for automatically varying the effective cross sectional area of the passage in accordance with variations in weight of different users.

3. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein to contain a liquid and adapted to receive a cable, means whereby the liquid in the drum is caused to flow backwards and forwards from one part of the drum to another when the drum is rotated, means for attaching the frame to the operator, means for automatically controlling the rate of flow of said liquid and means operable by the operator during his descent for controlling the rate of flow of said liquid.

4. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein to contain a liquid and adapted to receive a cable, a central shaft, a diaphragm slidably mounted on said central shaft, internal cam projections on the drum which engage said diaphragm so as to cause the liquid in the drum to flow backwards and forwards from one part of the drum to another when the drum is rotated, means for attaching the frame to the operator and means operable by the operator during his descent for controlling the rate of flow of said liquid.

5. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein and adapted to receive a cable and to contain a liquid, a hollow central tube for the drum forming a valve chamber, means whereby the liquid in the drum is caused to flow from one part of the drum to another when the drum is rotated, means for attaching the frame to the operator, and means operable by the operator during his descent for controlling the rate of flow of said liquid.

6. In a portable fire escape as claimed in claim 5 means for normally preventing the hollow central tube from rotating and means which allows it to rotate when the drum is being rewound.

7. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein to contain a liquid and adapted to receive a cable, a hollow central shaft forming a valve chamber, a diaphragm slidably mounted on said central shaft, internal cam projections on the drum which engage said diaphragm so as to cause the liquid in the drum to flow backwards and forwards from one part of the drum to another when the drum is rotated, means which allows the hollow shaft to rotate when the drum is being rewound, a rewinding handle, movement of which into its operative position automatically permits rotation between the hollow central shaft and the frame, means for attaching the frame to the operator and means operable by the operator during his descent for controlling the rate of flow of said liquid.

8. A portable fire escape as claimed in claim 5 in which the central tube is provided with ports adapted to restrict the flow of liquid.

9. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein to contain a liquid and adapted to receive a cable, a hollow central shaft forming a valve chamber, a diaphragm slidably mounted on the said shaft, internal cam projections on the drum and which engage said diaphragm so as to cause the liquid in the drum to flow backwards and forwards from one part of the drum to the other when the drum is rotated, ports in the hollow central shaft, spring actuated means subjected to the action of the liquid to control the effective areas of the ports, means for attaching the frame to the operator and means operable by the operator during his descent for controlling the rate of flow of said liquid.

10. In a portable fire escape, the combination of a frame, a drum rotatably mounted therein to contain a liquid and adapted to receive a cable, a hollow central shaft forming a valve chamber, a diaphragm slidably

mounted on said central shaft, internal cam projections on the drum which engage said diaphragm so as to cause the liquid in the container to flow backwards and forwards from one part of the drum to another when the drum is rotated, means for preventing the said shaft from rotating except when the drum is being rewound, a rewinding handle, movement of which into its operative position automatically permits rotation between the hollow central shaft and the frame and also prevents the flow of liquid, means for attaching the frame to the operator and means operable by the operator during his descent for controlling the rate of flow of said liquid.

In testimony that I claim the foregoing as my invention I have signed my name this 1st day of March, 1927.

JAMES DERMOT REDMOND.